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DNA Molecules for Single Polymer Dynamics and Rheology Studies RAE ROBERTSON, STEPHAN LAIB, DOUGLAS E. SMITH, UCSD — A major topic in complex fluids research is to understand how macroscopic properties of polymeric fluids arise from microscopic molecular dynamics. Traditional experiments measuring bulk rheological properties often only test microscopic theories indirectly. Manipulation and visualization of single polymers using optical tweezers and fluorescence microscopy allows direct determination of microscopic dynamics and testing of molecular theories. DNA is employed as a model polymer in these experiments and here we report on the preparation of monodisperse DNA samples covering a wide range of chain lengths in circular and linear forms. In addition to having biological relevance, DNA molecules have many advantages as a model for polymer physics and rheology studies. Using techniques in molecular biology, exactly monodisperse solutions of DNA molecules are produced with a precise control of polymer length and topology and replicated exactly and limitlessly. These samples will expand research possibilities in this area and will be provided as a resource to researchers in polymer physics, rheology and biophysics.

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